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The Files - RD-107, T.O. 10

28 November 1958

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Trip Report - Transmitter, RT-21

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1. On 19 November 1958 a visit was made to the [REDACTED] to monitor progress made on the development of the RT-21 Agents Transmitter. Persons present at the discussions were:

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2. The development of this transmitter provides for automatic tuning over the frequency range of 3 to 30 mc by merely inserting a crystal into the crystal oscillator. To provide for this automation, [REDACTED] is investigating two approaches, electrical and mechanical. In the electrical approach, a vari-cap diode or other semiconductor material will be utilized to provide the proper amount of tank capacitance for a given frequency of operation. This diode has the capability of changing its capacitance approximately 3 to 1 when a bias voltage change of 0 to 23 volts DC is impressed across its sides. The mechanical approach would utilize a servo motor which will control the tuning of a capacitor and/or inductor.

3. A demonstration was conducted which illustrated automatic tuning of a crystal oscillator and buffer amplifier between the frequencies of 7 and 11 mc. This circuitry used a semiconductor diode for electric tuning of the tank circuits. A modulator, which rectifies the AC signal from the DC to DC converter, charges a capacitor from 0 to 23 volts DC. This sweeping voltage is then impressed across the diode in the tank circuit thus decreasing its capacitance until a resonant state exists. At this resonance the error pick-up loop in the buffer tank will cut off the modulator and stabilize the voltage across the diode. Any leakage across this capacitor will be automatically compensated for by the action of the error sensing circuitry.

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4. [ ] is designing the transmitter in two bands, 3 to 15 mc and 15 to 30 mc. On band one the frequency of operation will be at the fundamental of the crystal, and on band two the frequency of operation will be at the second harmonic of the crystal. [ ] received several samples of barium titanate and it is hoped that this material will improve the capacitance change required for the frequency range of operation.

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5. The antenna matching network of the transmitter is required to match antenna impedances of 25 to 1200  $\pm$  j1000. [ ] stated that they are presently attempting to match this antenna impedance with a [ ] or L network that will be mechanically tuned by servo motors. The error sensing circuits for antenna matching consist of a phase and amplitude detector which will determine when the power at the output of the transmitter and matching network is equal. Difficulty in balancing the error sensing circuit for a null condition was encountered because of the very low power level available.

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6. The [ ] semiconductor division is presently investigating transistors for operation in the kilomagacycle region. [ ] requested that they be allowed to utilize 5% (approximately \$5,000 to \$10,000) of the engineering funds from the RT-21 Transmitter to determine if their people could, by extrapolating their kilomagacycle theory down to the 30 megacycle region, develop a 5 to 10-watt transistor. Because of the good possibility that the industry as a whole will develop a high-powered transistor (more than one watt) within a year and the seemingly small amount of funds asked for this development by [ ], the writer stated that no funds from the RT-21 project would be allowed for developing a high-powered transistor for operation at 30 megacycles. Assuming a high power transistor is developed by someone other than [ ], a possible delay is foreseen in obtaining this device for inclusion in the RT-21. This feature could conceivably hold up the completion of this project.

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